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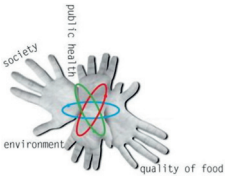

Concept of Interdisciplinary Training for Master and PhD students in Human Security

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Abstract

The book delivers the Concept of Interdisciplinary Training (CIT) for Master and PhD students in Human Security that has been developed in frame of the TEMPUS project "Human Security (environment, quality of food, public health and society) on Territories Contaminated by Radioactive Agents".

The material presented is aimed to university teachers and students that are active in the areas of *environment, quality of food, public health and society* to enhance the human safety. the ideas and approaches could be of the wide public interests, too.

This project has been funded with support from the European Commission within the framework of the Tempus Project "Human Security (environment, quality of food, public health and society) on the Territories Contaminated by Radioactive Agents". This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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ABOUT THE TEMPUS PROJECT

The Tempus Project* is funded by the European Commission. The objectives of the Project are the following:

— to support the modernization of Higher Education in Partner Countries of the surrounding area of the EU and Central Asia;

— to establish an area of cooperation between the EU and the Partner Countries;

— to favour voluntary convergence with the EU developments in the field of Higher Education.

"Human Security (environment, quality of food, public health and society) on the Territories Contaminated by Radioactive Agents" is a joint project of several organizations-consortium members which are University of Cordoba (Spain) being the coordinator of the Project, University of Parma (Italy), Swedish University of Agriculture Sciences (Sweden), University of Florence (Italy), Riga Technical University (Latvia), Voronezh State University (Russia), Chelyabinsk State University (Russia), Tyumen State Medical Academy (Russia), Ural Federal University named after the first President of Russia B. N. Yeltsin (Russia), Nuclear Cities Educational Information Center (Russia), Sevastopol National University of Nuclear Energy and Industry (Ukraine), Zhytomyr State Technological University (Ukraine), Vinnytsya National Pirogov Memorial Medical University (Ukraine),

Kyiv International University (Ukraine), Polissya Branch of Ukrainian Research Institute of F&FM (Ukraine), International Sakharov Environmental University (Belarus), Grodno State Agrarian University (Belarus), Grodno State Medical University (Belarus), Belarusian State University (Belarus).

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CONTRIBUTORS

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Contribution to this publication made by the following individuals representing both the Partner Universities and the European ones is acknowledged: Sergey Balashenko (Belarus), Ekaterina Mikhaylenko (Russia), Marina Banzarakcaeva (Russia), Valeriy Mikhaylenko (Russia), Pavel Baradzin (Belarus), Franco Milano (Italy), Anna Beltikova (Russia), Ihar Naumau (Belarus), Iryna Davidova (Ukraine), Yulya Omelchuk (Ukraine), Sergey Ovchinnikov (Russia), Maria Frolova (Ukraine), Dmitry Pobedash (Russia), Olga Galiulina (Russia), Natalya Prokopenko (Belarus), Sergej Golovatij (Belarus), Olexandr Pylypenko (Ukraine),Vladimir Kamynin (Russia), Aleh Rodzkin (Belarus), Eduard Kashuba (Russia), Klas Rosén (Sweden), Ruslana Kharkovenko (Ukraine), Eugenie Ryaboshtan (Ukraine), Igor Krasvin (Russia), Boris Samotokin (Ukraine), Semjon Kundas (Belarus), Zoya Shelest (Ukraine), Semen Kurolap (Russia), Ludmila Suplotova (Russia), Sergey Likhachev (Russia), MykhailoVinichuk (Sweden), Vladimir Yelishev (Russia), Yauhenii Maisiayonak (Belarus), Evgeniy Zhilyakov (Russia), Vasyl Mamray (Ukraine), Albert Zhloba (Belarus), Svetlana Mazurek (Belarus).

GENERALITY

The aim

Concept of Interdisciplinary Training (CIT) is aimed to assist implementation of the EU modern methods of Master and PhD students' training at the universities of Belarus, Russia and Ukraine in the fields of human security (HS) including environment, quality of food, public health and society for territories of Byelorussia, Russia and Ukraine contaminated by radioactive agents.

The outcome

CIT provides:

- the general approach to develop and implement interdisciplinary education based on EU experience for Master and PhD students' training in the field of human security including environment, quality of food, public health and society;
- specific approaches to develop and introduce EU modern methods of Master and PhD students' training in the areas:
  - HS and Society;
  - HS and Environment;
  - Quality of Food for HS;
  - Public Health for HS.

CONCEPT
OF THE INTERDISCIPLINARY TRAINING

The EU countries have mostly one scientific degree (PhD). However, the partner countries have two level system of the scientific degrees:

- candidate;
- doctor.

The candidate is generally recognized like the PhD, however the doctor corresponds to DSc. Nevertheless, CIT considers just PhD that fits the candidate degree.

The CIT is targeted to the MSc and PhD levels of education. the levels differs with:

- the MSc has to deliver the knowledge and skill to provide professional activities in the specific area;
- the PhD focuses knowledge and skill for the research activities in the specific fields.

Therefore the CIT looks separately for both for MSc and PhD.

CIT for MSc

General approach

The competences and skills targeted to HS, society, environment, quality of food and public health should be focused to the problems of the radiation contaminated territories. the specific fundamental competences in the single disciplines have also to be considered. For instance, after the fundamentals of the single discipline are delivered, particular attention and efforts will focus on practical applications to employ all competences related to contaminated territories and risk

for the population. Therefore, the above-mentioned topics of education should preferably have a common platform (CP) of education contents that will provide scientific achievements based on general competences and skills targeted to the specific wide range applications in contaminated areas. the competences and skills in the specific topics will be delivered on the base of the platform (Fig. 1).

So, the education could consist of two levels:

- fundamental topics of the CP (Level I);
- specific topics (Level II).

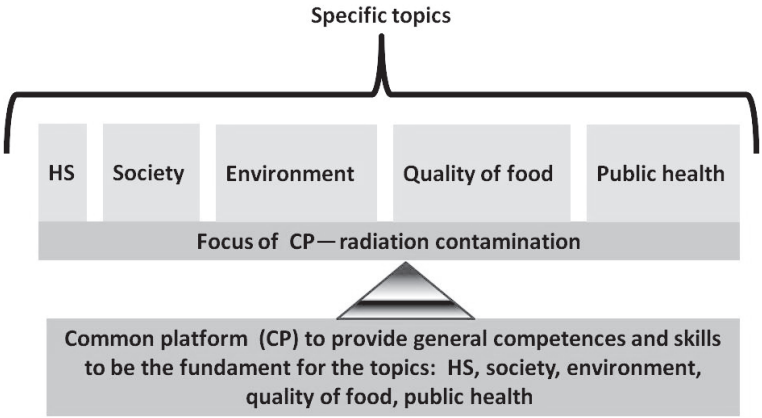

Fig. 1. Relation between the Common platform, radiation contamination focus, and specific topics

The two level structure could be provided for the trainees, too. the trainees could acquire the fundamental basic knowledge first and apply it to practical cases, as the second.

The CP is aimed to provide general competences and skills that should be multifaceted to the radiation contamination.

The CP will deliver general competences and skills in:

- HS,
- society,
- environment,
- quality of food,
- public health,
- radiation,
- statistics.

To reach this, an education approach that employs interacting topics should be provided alongside with training. Typically an interdisciplinary approach is in use, when education supplies competences because of teaching the areas that have joint boundaries (Fig. 2).

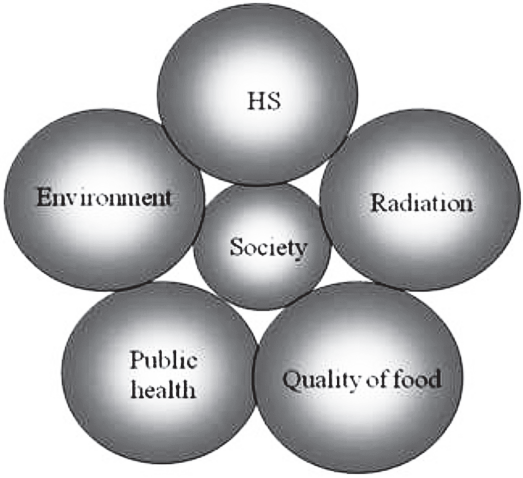

Fig. 2. Typical interdisciplinary education approach

Such the approach does not really bring to interdisciplinarity in the areas of knowledge. They are touching each other and interfere minimally. the areas do not penetrate into each other. in this case the education does not promote significant fusion of knowledge.

The alternative advanced novel approach is based on the knowledge convergence of sciences education*. in this case the areas are overlapping and the knowledge easily penetrates among the fields in addition the novel nucleus of knowledge development is fused because of the merged areas (Fig. 3).

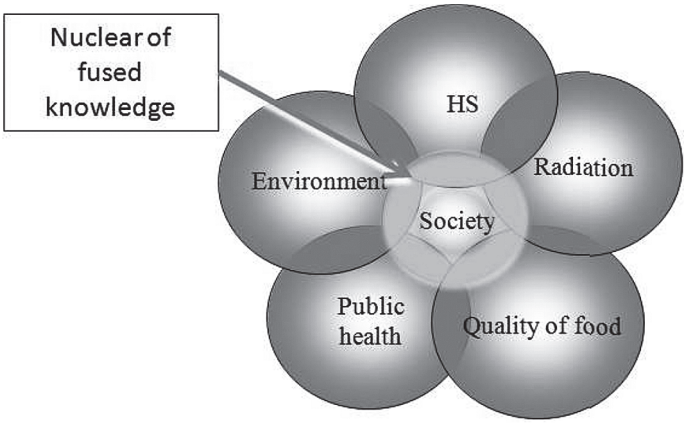

Fig. 3. Convergence education approach

The topics of the fused knowledge could be created on a base of the formula:

$$[X_A]A[Y_A] + [X_B]B[Y_B] = [X_{AB}]AB[Y_{AB}],$$

A, B — roots of the words indentifying essences of topics to fuse the new one;

AB — root of the word indentifying the essence of the fused topic;

$[X_A]$, $[X_B]$, $[X_{AB}]$ — prefixes of the words identifying topics to fuse the new one and the fused topic, correspondingly;

$[Y_A]$, $[Y_B]$, $[Y_{AB}]$ — suffixes of the words identifying topics to fuse the new one and the fused topic, correspondingly.

* Identification of New and Emerging Trends Using Advanced Science Convergence Based Curriculum / A. Vaseashta, E. Braman at al. // Material Research Spring meeting. USA, 2011. SS1.4.

For instance the topics to fuse the new one are “ecology” and “biology”:

$[X_A] = [Y_A] = [X_B] = [Y_B] = 0$;

$A = eco$;

$B = bio$;

$AB = ecobio$.

The fused topic is “ecobiology”.

The convergence of sciences education (CSE) approach has been selected to reach CIT.

The topics for CP

The fused topics derived on the base of CSE and recommended for the CP are the following:

- Fundamentals of ionizing radiation;
- Fundamentals of radioactivity (general knowledge of nuclear and atoms; radioactivity, types of radiation; the radioactive decay law; half-life time; activity, valuation procedure for radioactive contamination);
- Detection and dosimetry of ionizing radiations;
- Fundamentals of statistics;
- Fundamentals of radiocontamination;
- Human and society in contaminated area;
- Environment and contaminated environment;
- Radiation and quality of food;
- Fundamentals of radiation and public health — evaluation and control of risks.

Skill improvement

To develop the topics in the Table 1 the teaching staff and trainers are recommended to improve their skills to develop them in accordance with CSE. This can be performed in cooperation with the EU Universities within the TEMPUS project.

Modularization

CIT specific approach designs education/training approaches and materials in order to provide modules for the different contents. the modules are recommended to be made available for selection (guided selection or free selection) by the student in dependence on their specific interests. the modules are preferably to be delivered as short intensive courses. in all cases, the number of the credit points will be chosen according to the specifics of the different Universities implementing the modules.

CIT specific approaches and modules

HS and Society

Objective

The module refers to the cross-disciplinary studies of human security influenced by radiation at the contaminated territories, as well as the role of the society in building human-directed security policy. the module prepares students to identify, develop and implement effective activities that respond to environmental challenges at radiation contaminated territories. the module focuses both on the national and international contexts.

Tasks:

- to educate students for decision-making at international institutions, national governmental structures and business;
- to offer convergence of disciplinary curricula for both theoretical and environmental studies. This will promote students' ability to integrate theory and practice for systematic analysis, and management of key radiation related environmental problems.

Structure

The module consists of the submodules:

- Society & Human Security in Radioactive Zones;
- Human Rights on the Contaminated Territories.

The submodules will deliver integrated approaches towards theoretical understanding of the human security from the radiology point of view, radiation catastrophe in human psychology and human rights (tabl. 1).

Table 1

Recommended topics

Submodule	Topic	ECTS credit points (suggested)
Society & Human Security in Radioactive Zones	Environment and Sustainable Development	2
	An approach to Human Security	2
	Role of the radioactive catastrophe in the actualization of Human Security issues: historical and social aspects	3
Human Rights on the Contaminated Territories	The legal support of human security in territories of radioactive contamination	4
	The legal status of territories of radioactive contamination	3
	Radio-Security and humans rights	3
Total		*17*

HS and Environment

Objective

The module will focus on education and skill for understanding of radionuclides and their migration.

Tasks:

- to deliver general knowledge on the presence of radionuclides in the environment, impact on living organisms, and decontamination;
- to provide knowledge about relevant analytics and instrumentation.

Recommended topics:

- Radioisotopical environment, natural and anthropic origin, including air, soil, waters.

– Migration of radioisotopes in the environment: microorganisms, plants, animals, humans; bioaccumulation.
– Fundamentals on the radiation influence on living organisms at the level of individuals and populations including toxic, genotoxic effects.
– Mechanisms of the organisms resistance to radiation.
– Radioecological monitoring: technical tools, techniques, radiomeasurements, geoanalytical support.
– Analysis, assessment, management, prognosis, of radioecological risks and methods of protection in emergencies.
– Fundamentals on decontamination of substrates.
– Legal aspects of radiocontamination, study of national and international regulations.

Quality of Food for HS

Objective

Improving the knowledge, skills and professional competences study the quality and safety of food products on the territories contaminated by radioactive agents.

Tasks

A. Optimization of nature use on contaminated territories;
B. Countermeasures to prevent and reduce contamination of agriculture, fishery and forestry products;
C. Technological processing of products contaminated with radionuclides.

Recommended topics

Task A:

– investigation of radiation situation on agricultural territories, in forests and water bodies for further prognostication of radiation pollution levels in food;
– prediction of radiation situation on agricultural territories, in forests and water bodies; rehabilitation processes on the territories

contaminated by radionuclides; factors that determine these processes and measures for their intensification;
- specification of the role of different food products in the complex assessment of body radiation burden;
- ecological and economical validation of countermeasures for reduction of radiation contamination in forestry and fishery food products;
- the system of measures to reduce the intensity of radionuclides' income into food products.

Task B:
- investigation of radionuclides migration in man-made ecosystems for further development of measures on reduction of radionuclides uptake in agricultural production, forestry and fishery food products;
- the efficiency of countermeasures that are directed on the intensity reduction of radionuclides' penetration into food products;
- standardization of the food products use considering the legislation, normative documents and information as for the food products' radiation contamination;
- making decision on the further agricultural production and on the use of forestry and fishery food resources;
- the analysis of radiation situation on the territories polluted by radionuclides for making decisions on the changes in the field of an enterprise activity, in their separate directions or subdivisions.

Task C:
- the techniques for determining the allowable radionuclides levels in food products;
- scientific validation of optimal technologies for agricultural, forestry and fishery food products processing;
- foods and radioprotectors that reduce contamination of a human body;
- the use of mathematical model for radiation pollution levels prediction in agricultural, forestry and fishery products for determining the possible risks for a human.

Public Health for HS

Objective

The module will introduce up-to-date European approaches to train MSc and PhD students in the field of Public Health for Human Security, particularly in connection with possible nuclear accidents and the subsequent radiation contamination. the module will focus the education and skill on radioactive contaminants, their migration in the environment and their presence in the food chain in order to prevent or reduce the internal contamination of population

Tasks:

- to improve the theoretical knowledge and the practical skill to protect population from radioactive shock hazard;
- to improve the theoretical knowledge and the practical skill for an efficient management in public health for human security in cases of natural and man-made radiation related emergency situations.

Structure:

- general basic topics;
- specific topics.

Recommended topics

The general topics

1. Physics of ionizing radiation.
2. Dosimetry.
3. Radiobiology.
4. Radioprotection.
5. Statistics for public health.

The specific topics

1. Principles of public health.
   - 1.1. Health and disease: definition of health, etiologic agents and risk factors, natural history of the disease.
   - 1.2. Determinants of health: modifiable and non-modifiable determinants, proximal and distal determinants.
   - 1.3. Public health: definition and aims.

1.4. Health promotion: the interventions aimed at improving the quality of life and the health status of each single person and of the communities as a whole.

1.5. The evolution of health systems: Beveridge and Bismarck models, Declaration of Alma-Ata and definition of Primary Health Care.

2. Radiation inspired prevention of health and its promotion.

2.1. Prevention:

2.1.1. primary prevention: the removal of risk factors from the impact towards the population.

2.1.2. secondary prevention: the sum of the interventions aimed at lowering the incidence of diseases, acting in the so-called latency period. Population screening.

3. Epidemiology.

3.1. Basic concept.

3.1.1. Causation and causal inference: casualty, strength of effect, causal criteria.

3.1.2. Measures of occurrence: absolute counts, proportions, ratios and rates. Indicators of population health.

3.1.3. Measures of effect and measures of association: risk measures, confounders.

3.1.4. Data sources.

3.2. Epidemiologic studies.

3.2.1. Experimental studies: clinical trials, field trials, community intervention and cluster randomized trials.

3.2.2. Non-experimental (observational) studies:

3.2.2.1. Descriptive studies.

3.2.2.2. Analytical studies: cross-sectional, cohort, case-control, ecological.

3.2.2.3. Evaluative Epidemiology: evaluation of screening interventions.

3.2.3. Strategies to improve validity, precision and accuracy in epidemiological studies.

3.2.4. Environmental epidemiology.

4. Radiation contamination inspired risk analysis of health.
   4.1. Principles of risk analysis
   4.2. Risk assessment: hazard identification, dose-response assessment, exposure assessment, risk characterization.
   4.3. Risk management.
   4.4. Risk perception and communication.

CIT for PhD

The PhD education is directed to the research in the specific area of science and has to fuse fundamental and partial dimensions. the education turns the students to the outstanding intellectual abilities and a strong commitment to research.

Requiring a minimum of three years, the PhD education should consist of fundamental and specific topics.

The following fundamental topics are recommended for the PhD studies:

- HS,
- society,
- environment,
- quality of food,
- public health,
- radiation,
- statistics.

The specific topics are of the partner university expertise and responsibility, following the same guidelines as provided for the Master, without attending lectures.

RECOMMENDATIONS TO IMPLEMENT CIT

The guidelines for the Belarus universities

MSc students' training

Interdisciplinary approach is recommended to be realized in two ways:

1) Upgrading of existing MSc specialties by introducing in syllabus new disciplines connecting with HS study frame;
2) Development of new MSc specialties tightly connected with HS study frame.

According to specialization of the partner universities in Belarus and taking into account all directions of HS the first approach can be recommended for Belarusian State University (BSU), Grodno State Agriculture University (GSAU) and Grodno State Medical University (GSMU).

At **Belarus State University** the interdisciplinary HS-Master training can be applied for the specialty "Political Science" as one of direction of human security providing on the territories contaminated by radioactive elements after the Chernobyl disaster. the significance of such training is enhanced due to the construction of Nuclear power Plant in Ostrovets district of Belarus.

At the present there are numerous legal acts establishing state policy of the Republic of Belarus in human security. This policy is expressed, among others, in the laws of the Republic of Belarus on May 26, 2012 "On the legal regime of territories contaminated as a result of the Chernobyl nuclear power plant accident", on January 5, 1998 "On Radiation Safety", July 30, 2008 "On the Use of Atomic Energy", January 6, 2009 "On social protection of citizens affected by the Chernobyl disaster, other radiation accidents", Decree of the President of the Republic of Belarus "On some measures to build a nuclear power plant", as well

as State program to overcome the consequences of the Chernobyl disaster for 2011–2015 and for the period until 2020.

Specialty 1-23 80 07 "Political Science" in accordance with OKRB 011-2009 "Specialties and qualifications" refers to the profile of education "Communications, Law, Economy, Management. Economics and Industrial Engineering" and provides a master's degree in political science.

Planning volume of a student auditory and self-study work is conducted in accordance with requirements of the educational standard for the specialty 1-23 80 07 "Political Science" (ESHE 1-23 80 07-2012).

In order to implement CIT and tasks of the project two new disciplines can be included into the curriculum as disciplines of cycle of special training courses (component of higher education institutions) — "Processes of decision-making to ensure the safety of human life" and "Processes of implementing decisions to ensure the safety of human life".

Introduction of the discipline "Processes of decision-making to ensure the safety of human life" will provide formation of system of knowledge concerning processes of political decisions adoption to ensure human activity on territories of radioactive pollution both on national, and on international levels; formation of the student identity as a citizen, ecologically educated, with the developed ecological thinking; creation of the strong knowledge base in the field of a state policy, human life security on territories of radioactive pollution on the basis of studying achievements of world and national political thoughts; strengthening the socially-oriented values, culture of rational decision-making.

The discipline "Processes of implementing decisions to ensure the safety of human life" is aimed at understanding of basic ecological categories and problems related to radioactive contamination, the formation of the respective subject and operational competencies; development of sustainable interest to environmental issues and processes of implementing solutions to ensure the safety of human life on territories of radioactive contamination, the desire for self-education;

orienting students to reflect on and analyze the process of implementing solutions to ensure the safety of human life on territories of radioactive contamination in the country and in the world; approval of citizenship, active personal position of future specialists in solving environmental problems; gaining the skills of managerial decision-making, understanding the trends of government policy, implemented in specific areas (environmental protection and environmental security, agriculture, health, education, etc.).

Preparing masters using a modified curriculum in the framework of the TEMPUS project will expand their scientific knowledge in the field of public policies aimed at human security on the territories contaminated by radioactive agents as well as form a comprehensive knowledge, including the social, legal and medical aspects and skills of their implementation.

Grodno State Agrarian University is recommended to upbraid in the frame of HS the MSc specialty "Agronomy".

According to the national classifier of the Republic of Belarus 011-2009 the specialty of "Agronomy" belongs to the educational type "Agriculture and Forestry. Landscape Engineering", the educational line 74 "Agriculture" and it ensure earning the degree of the Master of Agricultural or Biological Sciences.

In order to implement interdisciplinary education and to achieve project's objectives two new disciplines could be included in the curriculum in the cycle of disciplines which realizes the special training out of higher education establishment component. These two new disciplines are "Social and Legal and Medical Principles of Human Security on the Territories Contaminated by Radio agents" and "Security of Food Produced in the Conditions of Territories Radioactive Contamination".

The disciplines give a chance to form theoretical skills on legal status of the radioactive contaminated territories and citizens living on these territories, to teach to international law in the sphere of Human security on the contaminated territories, principles of agricultural production

in the conditions of radioactive contamination including regulatory legal acts, to form theoretical knowledge and practical skills in the field of health population living on the territories contaminated by radio agents.

Combination of study materials regarding to radionuclide behavior, its migration in environment and food chain; agricultural, forest and water management in the conditions of radioactive contamination have determined the discipline "Security of food produced in the conditions of radioactive contamination" and modified discipline "Modern technologies in plant growing and feed production" to have been included to the curriculum.

At **Grodno State Medical University** in the frame of HS interdisciplinary approach is it reasonable to upgrade the MCs specialty "Hygiene" that is more connected with HS training directions. It is possible to extend the above specialty with the special course "Human Security (environment, quality of food, public health and society, social and legal security) on the territories contaminated by radioactive agents".

The main study topics of the course are:

- radioactivity, radiation doses, radiosensitivity;
- radiation exposure, caused by anthropogenically changed background radiation;
- radiation accident;
- principles of radiation exposure reduction in the organism;
- legislative acts and human rights on the contaminated territories;
- organization of nutrition on the radiation-contaminated territories;
- functioning of the Geographical Information systems and IT;
- principles of radiation exposure reduction in residents of the contaminated territories;
- health care of population residing on the radiation-contaminated territories.

The curriculum based on the European Partner Universities experience and interdisciplinary approach includes not only issues of general hygiene but principles of radiation safety, Geographic Information Systems (SNUNEI) and IT functioning, issues of medical aid provision to citizens, legislative acts and Human Rights on the Contaminated Territories.

The second way for realizing of HS approach is development of new MSc specialties tightly connected with the HS study frame. It is possible to realize on the base of the **International Sakharov Environmental University** as specialized university in the field of environmental science.

HS approach is reasonable to realize in the frame of MSc training direction "Radiobiology". The program could be based on the European Partner Universities experience.

According to CIT the recommended disciplines are introduced in Table 2 below.

Table 2

Recommended disciplines

Topics	Disciplines	ECTS credit
HS and Environment	Radioactivity & Ecosystems; Radiation detection and control; Radiotoxicology and Risk Assessment	4,5 4,5 2,5
HS and Quality of food	Radioecologycal monitoring and analysis	4,5
HS and Public health	Molecular and cellular radiobiology; Radiation Biochemistry; Medical and environmental rehabilitation; Psychological rehabilitation; Data Analysis and GIS in Radiobiology	4,5 3,0 7,0 4,0 2,0
HS and Society	Legislative aspects of human security on radionuclide polluted areas; Sustainable development	3,0 2,0
Total		*41,5*

The discipline “Legislative aspects of human security on radionuclide polluted areas” could be provided for ISEU by Belarusian States University. the discipline “Sustainable development” has been introduced and developed by ISEU for Belarusian States University.

The Masters Degree Program of specialty “Radiobiology” has been considered and approved at the meeting of the Training Council ISEU.

The specialty 1-33 81 02 “Radiobiology” has been included in the state classifier and qualifications. the permission of the Ministry of Education of Belarus for the opening this specialty and the recruitment of masters students in 2014 were obtained.

The procedure of practical implementation of above introduced recommendation is:

1) Development of syllabus of the specialty (if not present);
2) Development of the specialty standard (if not present);
3) Coordination of standard with Ministry of Education;
4) Reserving of Ministry of Education permeation for MSc training in certain university.

PhD students’ training in the field of the human security (HS)

According to the specifics of training program in aspirantura of the Belarus universities (predominately research work, discipline ”Specialty” — without special training) it possible to recommend implementation of interdisciplinary HS approach realizing in two directions:

1) in the frame of going through specialty examination;
2) in the frame of dissertation research plans of PhD student working in appropriate fields.

The first direction can be realized by local addition of HS topics to the Program of Candidate Minimum without adaptation in High Attestation Commission (HAC). This addition can be adopted temporary by decision of University Council.

According to the adopted Program of Candidate Minimum PhD students are obliged to study HS topics without the assistance and go

through examination at the end of study process. in Belarusian partner universities this approach can be realized for the following specialties of aspirantura:

Belarusian State Universities:

Specialty: Land law; natural resources law; environmental law; agrarian law.

Belarusian State Agriculture University

Specialty: "Agrochemistry".

International Sakharov Environmental University:

Specialty: "Radiobiology".

Grodno State Medical University:

Specialty: "Hygiene".

The second direction — implementation of HS topics in the frame of dissertation research plans of PhD student. It can be realized in the frame of activity of special chairs and PhD student supervisors during dissertation theme and dissertation plan of PhD students formulation and official approval.

The guidelines for the universities of Russia

The background for CIT in Russia

In 2010 the Government of the Russian Federation adopted new (third) State Educational Standards*. High education system in Russia now has only undergraduate, graduate and post- graduate levels**. All universities and institutes from September 2011 should admit students on these three levels; they should develop new educational programs or update the previous according to the new Educational Standard.

* See for ex., new educational standard for URL: http://www.edu.ru/db/cgi-bin/portal/spe/spe_new_list.plx?substr=031900&st=2010&qual=2 (mode of access: 29.03.2016).

** 1 See for ex., new educational standard for IR (URL: http://www.edu.ru/db/cgi-bin/portal/spe/spe_new_list.plx?substr=031900&st=2010&qual=2) (mode of access: 29.03.2016).

Moscow's universities in the collaboration with the Departments of Ministry of Education prepared the majority of documents that become the basis of this new educational standard.

New educational standards are based on main principles of Bologna System such as three levels of education (Bachelor, Mater and PhD), ESTC system and universality in quantity of credits for each level and etc. Nevertheless besides these quantitative changes the accent was made on the quality of education in Russian Universities. Analysis of educational standards has demonstrated that Dublin's descriptors were used as the basis for competence-based approach for Master's training.

Thus by the end of 2011 practically all Universities of the Russian Federation have changed their curriculum and principles of education and adopted these three-level type of education. Nevertheless some Universities still have 5-year program (so-called "specialist-program"). Such programs are aimed to make the first level of education longer than traditional bachelor's level. the great part of Medical and Technical Universities are allowed to have these 5-year programs due to the vital importance of the future specialists and their competences for industry and country's needs. So now in the Russian Federation we have typical to EU three-level educational system and some educational programs, which are unusual to EU system.

CIT for universities of Russia

Four Russian Universities participate in the TEMPUS project: Chelyabinsk State University (CSU), Ural Federal University (UrFU), Voronezh State University (VSU) and Tyumen State Medical Academy (TSMA). There are some peculiarities in adaptation of CIT and Human Security issues.

First, three universities have three-level of education (CSU, UrFU and VSU) and their master's programs are developed in the same manner: 2-year program, 120 credits. Each program has four parts in curriculum: obligatory courses (recommended by Ministry of Education), recommended (professional) courses, optional courses (developed by

concrete University for concrete specialization) and internship and thesis writing module. Tyumen State Medical Academy is still preparing 5-year specialists and they have few programs, which are developed as typical master's program, for example, master's program in public health. the great part of the curricula of this program has much obligatory courses that make it less flexible for adaptation new courses and modules.

Second, in the Russian Federation each master's program is specialized in the framework of general sphere of science or scientific direction. So, the basis for realization of CIT and Human security issues are different due to the differences of specialties at each university: ecology and environmental management (CSU); international relations (UrFU); ecology and natural recourses management (VSU) and public health (TSMA). These specialties determine the principles of applying CIT.

The common thing for all Universities is that all of them decided not to open and accredit new specialty or specialization on Human Security, but to include new module on HS according to the principles of CIT. Module is a set of courses, which are directly devoted to the issues of HS in the contaminated territories. These modules include as new courses as well as the modernized existing courses (modification of the syllabi, including new topics).

The differences to apply CIT lie in the accents that are made both in fundamental level and in the specific level of CIT. For example, medical and ecological programs use convergence principle in the fundamental part with the accent made on natural sciences and to a lesser extent on social issues; International Relations program vice verse applies convergence principle in the fundamental part with a less diving into natural sciences, takes only basic things and more attention is paid to social issues, historical and theoretical approaches.

The second level is quite different in all four Universities. the courses in this part are very special and are correlated with the concrete specialization. As all Universities participate in different working groups

of the project the specific recommendations on the content of the specialized courses come from working group.

The main challenges for all Russian Universities were connected with the differences to introduce new courses into master's curriculum due to differences in the structures of curriculum in each University and with less flexibility for transformation of each curriculum. All Russian teams were seeking it's own way how to escape bureaucratic barriers in introducing new courses into existing curriculum. Some Universities prefer to change syllabi of existing courses and introduce only few new courses into curriculum; some prefer to introduce new courses but only into optional part of curriculum. And the main accent in each master's program was made on the transformation of content and using new teaching methods in order to reach the goals of CIT.

PhD training

According to new Educational Standard all PhD Programs in the Russian Federation there have three-year education. The PhD curriculum has two parts — obligatory and elective courses. Obligatory courses are proposed by the Ministry of Education and couldn't be transformed. Therefore, both levels of CIT could be adopted into the elective part. the main accent in PhD training is made on research work and thesis writing. the requirement for PhD candidate is to choose the aspects of HS as the theme for PhD thesis.

The recommendations for the Ural Federal University as the typical example

The realization of HS topics would be in the framework of existing Master's program "Global and Regional Security". New topics and new courses should form the "Human Security and Society" module. This module refers to the cross-disciplinary studies of radiation security, human security in the contaminated territories and the role of the society in elaborating human- oriented policy.

The module's courses could prepare students for identifying, developing and implementing effective solutions to environmental challenges

in the radiation contaminated territories, both in a national and in an international context. They aim to educate future decision-makers in government, international structures, and non-profit organizations. Module would offer convergence disciplinary curricula in theoretical and environmental studies that challenges students' ability to integrate theory and practice for systematic analysis, and management of key environmental problems in international and regional social contexts.

As a cross-disciplinary development approach, the Module could comprises not only various forms of radiation, environmental, and human safety and security; it also would refer to questions of non-traditional secure challenges such as disasters, human factor, human rights on the contaminated territories, psychological and social consequences of radiation threats.

The fundamental topics would be integrated into the obligatory courses, such as Global Security and Global Trends and Global Challenges. the new courses would be integrated into recommended and elective parts of the curriculum. These courses integrate different approaches towards theoretical understanding of human security and radiological approach, perceptions of radiation disasters in human psychology and in society and the role of law and implementations of human rights in the contaminated territories.

The guidelines for the universities of Ukraine

The background for CIT in Ukraine

Training of experts in Ukraine is carried out on base of the degree system: Bachelor (first level), Specialist and Master (second level), Candidate of Science (third level) that is the analogy to the PhD. Ukraine has one more (highest) qualification level — Doctor of Science. List of areas of studies (for Bachelor) and specialities (for Specialist and Master) are approved by the Cabinet of Ministers of Ukraine. Currently, there are lists adopted in 2006 and 2010. Formation of the content

of training specialists is regulated by the Law of Ukraine "On Higher Education".

In a functional way the educational activity is regulated by Enactments of the Cabinet Ministers of Ukraine, such as:

- On Approval of the State Standard of the Basic and General Secondary Education;
- On Urgent Measures for the Implementation of the External Independent Evaluation and Monitoring of Education Quality;
- as well as Orders of the Ministry of Education and Science of Ukraine, such as:
- On Approval of the Regulations on Holding of External Independent Evaluation of Educational Achievements of Graduates of General Secondary Education in 2014;
- On Approval of the Conditions of Admission to Higher Educational Establishments of Ukraine in 2014;
- On Ensuring the Functioning of the Information System "Competition", etc.

The implementation of any educational program occurs through the process of licensing and accreditation. Activities in the field of higher education are licensed in cases where the alleged directions (specialities) are included in the approved by Cabinet of Ministers of Ukraine lists of areas and specialities. University is determined by the direction first, and then according to specialities which are in this area. Licensing of Master's programs without accreditation of the field of study (of the Bachelor level) is not allowed.

Licensing — is a national recognition of an ability of higher educational institutions to start activities related to the provision of educational services in a certain direction at a certain level of the qualification, in accordance with the standards of higher education, as well as state requirements regarding personnel, methodological and logistical support.

Accreditation of speciality — is a public recognition of the relevance level of state training requirements, standards of higher education and

state requirements regarding personnel, methodological and logistical support.

Licensing and accreditation procedures are determined by the Cabinet of Ministers of Ukraine. to obtain a license for training professionals and during accreditation process of a University, the University is being inspected by the Ministry of Education and Science of Ukraine. the inspection includes the characterization of the information, material and technical resources, human resources potential of higher educational establishment. Content of professionals' training is determined by components of educational standards of higher education of Ukraine and curriculum.

Licensing allows educational activities for one term of training (for Bachelor — 4 years, for Master — 1 year). Initial accreditation confirms the ability of the University to provide educational services. Higher education institutions that have successfully passed the accreditation of speciality, receive a certificate of accreditation, which is valid for 5 years. Re-accreditation extends the license for the provision of educational services.

Components of educational standards of any Master specialty are the basis of professional training:

- Educational qualification characteristics displays qualification requirements, typical tasks and competencies acquired;
- Educational and vocational training program defines the discipline (content modules), which provide vocational training;
- Diagnostic aids of the quality of training define requirements for the competence of specialist skills which ensure qualification level.

The recommendations for the Zhytomyr State Technological University and Sevastopol National University of Nuclear Energy and Industry

Zhytomyr State Technological University (ZSTU) started training Bachelors in the training course 6.040106 "Ecology, Environmental Protection and Balanced Environmental Management"

in 1998, Sevastopol National University of Nuclear Energy and Industry (SNUNEI) — in 2000. in 2003, training for ZSTU Masters in 8.04010601 "Ecology and Environmental Protection" was implemented, in SNUNEI — in 2005.

ZSTU and SNUNEI lunched the MSc education of 8.04010601 «Ecology and Environmental Protection» in 2003 and 2005 correspondingly.

Analysis of the capabilities of universities the universities could be recommended to implement and license the new Master specialty 8.04010605 "Radioecology" with professional qualification 2111.2 "Radiology Engineer". Such licensing was conducted, and universities began training Masters since September 2013. the professional training could be based on the components of educational standards of the Master speciality 8.04010605 "Radioecology".

In order to develop a branch standard of Master specialty 8.04010605 «Radioecology», a working group of the Ministry of Education and Science of Ukraine was created, the curricula developed considered the disciplines recommended by the working groups of projects and were examined by Scientific and Methodological Commission on Ecology of Ministry of Education and Science of Ukraine and were approved by the Rectors of both Universities.

In 2014 ZSTU and SNUNEI are recommended to undergo accreditation expertise. the universities are recommended to refer to the recommendations by the working groups of the project.

The recommendations for the Kyiv International University and Vinnitsya National Medical University

Kyiv International University (KIU) and Vinnitsya National Medical University (VNMU) are recommended to implement CIT in the frames of the existed accredited Master Programs through their modernization: KIU — direction of training 6.030204 "International Information", Master Specialty 8.03020401 "International Information"; VNMU — direction of training 6.120100 "Medicine", Master specialty 8.12010001 "Medical Business". Interdisciplinary effect of Master

Curriculum on specialty “International Information”, for instance, could be achieved through replacement of five disciplines by the University choice within new and modernized syllabuses of two existing discipline (one mandatory and one selective).

IMPLEMENTATION OF CIT

The Table 3–5 summaries the topic of the different areas across the corresponding module. Some gaps which are not completed are under further initiatives by the universities.

Table 3

The maps of CIT implementation over the countries and universities (Belarus)

Topic	Concepts of the topic	CSU	ISEU	BSU
Basilar information on radioactivity	Fundamentals of ionizing radiations	"Radioecology" – fundamental	"Radioactivity and Ecosystems", fundamental — obligatory	"Sustainable Development and Human Security" — Elective
	Fundamentals of radioactivity	—	"Molecular and cellular radiobiology" — fundamental / obligatory	—
	Detection and dosimetry of ionizing radiations	—	"Radiation detection and control" — fundamental/obligatory	—

Continuance tab. 3

Topic	Concepts of the topic	CSU	ISEU	BSU
Human and society in contaminated area	Theoretical approaches to Human Security	"International cooperation in the field of environmental protection" — fundamental "Human and environmental security in technogenic accidents" — obligatory	"Radioecologycal monitoring and analysis" — fundamental	"Processes of Implementing Decisions to Ensure The Safety of Human Life" (obligatory), "Sustainable Development and Human Security" (elective)
	Historical and social aspects of radioactive catastrophes (includes communication issues)	—	"Sustainable development" — elective "Psychological rehabilitation" — obligatory	—
	The legal status of territories of radioactive contamination	"Legislation and human rights on the territories contaminated by radionuclides" — obligatory	"Legislative aspects of human security on radionuclide polluted areas" — obligatory	"Legal Support of Security on Territories of Radioactive Contamination", "International Processes in the Field of Radiation Safety"
	Radio-Security and humans rights	—	—	"Human Rights on Territories of Radioactive Contamination"

Continuance tab. 3

Topic	Concepts of the topic	CSU	ISEU	BSU
Environment and contaminated environment	Radioisotopes in the environment from natural and anthropic origin, including air, soil, waters	"Radioecology" — fundamental	—	"Sustainable Development and Human Security" — elective
	Migration of radioisotopes in the environment: microorganisms, plants, animals, humans; concept of bioaccumulation	—	—	—
	Radioecological monitoring: technical tools, techniques, radiomeasurements, geoanalytical support	"Biomonitoring and biotesting" — obligatory; "Radiation-hygienic monitoring in the food industry" — fundamental	—	—
	Fundamentals on decontamination of environmental substrates (water soil air)	"Rehabilitation of territories contaminated by radionuclides" — fundamental	—	—

Continuance tab. 3

Topic	Concepts of the topic	CSU	ISEU	BSU
Quality of food in contaminated territories	Investigation of radionuclides migration in man-made ecosystems — uptake in agricultural production, forestry and fishery food products	—	"Radioactivity and Ecosystems" fundamental/obligatory	—
	Specification of the role of different food products in the complex assessment of body radiation burden	—	"Medical and environmental rehabilitation" — obligatory	—
	Countermeasures for reduction of radiation contamination in forestry and fishery food product, measures to reduce the intensity of radionuclides entry into food products	—	"Radiotoxicology and Risk Assessment" — obligatory	"Processes of Implementing Decisions to Ensure the Safety of Human Life" — obligatory
	Techniques for determining the allowable radionuclides levels in food products	—	"Radioecologycal monitoring and analysis" — fundamental	"Human Rights on Territories of Radioactive Contamination" — elective

Ending tab. 3

Topic	Concepts of the topic	CSU	ISEU	BSU
Fundamentals public health in contaminated territories	Radiobiology (effects on human beings according to different uptake routes)	"Public health and health care" — fundamental; "Human and environmental security in technogenic accidents" — obligatory	"Medical and environmental rehabilitation" — obligatory	—
	Radioprotection (principles, limitations, practical applications)	—	"Radiation Biochemistry" — obligatory	—

Table 4

The maps of CIT implementation over the countries and universities (Russia)

Topic	Concepts of the topic	TSMA	VSU
Basilar information on radioactivity	Fundamentals of ionizing radiations	"Radiation, ionizing radiation" — Fundamental / Compulsory	"Toxicology and Radioecology" — Fundamental / Obligatory
	Fundamentals of radioactivity	"Radiobiology and Medical Defence — Fundamental / Compulsory	—
	Detection and dosimetry of ionizing radiations	"Radiation monitoring"	—
Human and society in contaminated area	Theoretical approaches to Human Security	"Philosophic problems of natural science" — Fundamental	"History and methodology of geography, ecology and nature" Variable
	Historical and social aspects of radioactive catastrophes (includes communication issues)	"Health protection of population living on the contaminated territories" — Compulsory	—
	The legal status of territories of radioactive contamination	"Legislation and human rights on the territories of radioactive contamination" — Fundamental	—
	Radio-Security and humans rights	—	—

Continuance tab. 4

Topic	Concepts of the topic	TSMA	VSU
Environment and contaminated environment	Radioisotopes in the environment from natural and anthropic origin, including air, soil, waters	"Radiobiology and medical defence" — Fundamental / Compulsory	—
	Migration of radioisotopes in the environment: microorganisms, plants, animals, humans; concept of bioaccumulation	—	
	Radioecological monitoring: technical tools, techniques, radiomeasurements, geoanalytical support	"Radioactive monitoring" — Fundamental / Compulsory	—
	Fundamentals on decontamination of environmental substrates (water soil air)	"Epidemiology" — Fundamental / Compulsory	—

Ending tab. 4

Topic	Concepts of the topic	TSMA	VSU
Quality of food in contaminated territories	Investigation of radionuclides migration in man-made ecosystems — uptake in agricultural production, forestry and fishery food products	"Preventive medicine" — Fundamental / Compulsory	"Toxicology and Radioecology" — Fundamental / Obligatory
	Specification of the role of different food products in the complex assessment of body radiation burden	—	"Diets on radiation-contaminated areas" — Facultative / Elective
	Countermeasures for reduction of radiation contamination in forestry and fishery food product, measures to reduce the intensity of radionuclides entry into food products	"Preventive medicine" — Fundamental	—
	Techniques for determining the allowable radionuclides levels in food products	"Methods and means for supporting human security on the radioactive contaminated territories" — Fundamental / Compulsory	"Diets on radiation-contaminated areas" — Facultative / Elective
Fundamentals public health in contaminated territories	Radiobiology (effects on human beings according to different uptake routes)	—	"Toxicology and Radioecology" — Fundamental / Obligatory
	Radioprotection (principles, limitations, practical applications)	—	—

Table 5

The maps of CIT implementation over the countries and universities (Ukraine)

Topic	Concepts of the topic	KlU	SNUNEl	ZSTU
Basilar information on radioactiv	Fundamentals of ionizing radiations	"Basics of Radioecology and Radiation Security"	baccalaureate training	baccalaureate training
	Fundamentals of radioactivity	—	—	—
	Detection and dosimetry of ionizing radiations	—	"Radiation monitoring"	"Radiation monitoring"
Human and society in contaminated area	Theoretical approaches to Human Security	—	"Sustainable Development Strategy"	"Sustainable Development Strategy"
	Historical and social aspects of radioactive catastrophes (includes communication issues)	—	—	—
	The legal status of territories of radioactive contamination	—	"Sustainable Development Strategy"; "International environmental activities (in Radioecology)"	"Sustainable Development Strategy"; "International environmental activities (in Radioecology)"
	Radio-Security and humans rights	—	—	—

Continuance tab. 5

Topic	Concepts of the topic	KIU	SNUNEI	ZSTU
Environment and contaminated environment	Radioisotopes in the environment from natural and anthropic origin, including air, soil, waters	"Basics of Radioecology and Radiation Security"; "Sustainable Development of Society and Human Security"	—	"Radioecology"
	Migration of radioisotopes in the environment: microorganisms, plants, animals, humans; concept of bioaccumulation	—	—	—
	Radioecological monitoring: technical tools, techniques, radiomeasurements, geoanalytical support	—	—	"Radioecology"; "Radiation monitoring"
	Fundamentals on decontamination of environmental substrates (water soil air)	—	—	"Rehabilitation of areas contaminated with radionuclides"

Continuance tab. 5

Topic	Concepts of the topic	KIU	SNUNEI	ZSTU
Quality of food in contaminated territories	lnvestigation of radionuclides migration in man-made ecosystems — uptake in agricultural production, forestry and fishery food products	"Basics of Radioecology and Radiation Security"	"Radioecology (by fields)"	—
	Specification of the role of different food products in the complex assessment of body radiation burden	"Methods and Means to Maintain of Human Security on Radioactively Contaminated Territories"	—	—
	Countermeasures for reduction of radiation contamination in forestry and fishery food product, measures to reduce the intensity of radionuclides entry into food products	—	"Rehabilitation of areas contaminated with radionuclides"	—
	Techniques for determining the allowable radionuclides levels in food products	"Legal Support of Human Security on Territories of Radioactive Contamination"; "Sustainable Development of Society and Human Security"	"Radiation monitoring"	—

Ending tab. 5

Topic	Concepts of the topic	KIU	SNUNEI	ZSTU
Fundamentals public health in contaminated territories	Radiobiology (effects on human beings according to different uptake routes)	"Basics of Radioecology and Radiation Security" "Basics of Applied Sciences: Theory of Risks"	Baccalaureate training	Baccalaureate training
	—	—	"Radiation safety"	"Radiation safety"

Concept of Interdisciplinary Training for Master and Phd Students in Human Security

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